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***“Yes we are here, living, but malaria is surrounding us”*: making the connections between livelihoods and health using the Sustainable Livelihoods Approach in the Kilombero Valley, Tanzania.**

Abstract

This paper examines connections between sustainable livelihoods and the ability to deal with health risks. In the Kilombero Valley in Tanzania rates of mortality and morbidity from malaria remain high. Application of the Sustainable Livelihoods Approach (SLA) to a narrative of daily lives demonstrates that villagers have experienced a reduction in human, social, natural, physical and financial capitals, which limits their ability to follow health promotion advice. The focus on livelihoods highlights local developmental interventions that could have a significant impact on improving the health and wellbeing of the villagers, with potential relevance to other places in the Global South.

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“Yes we are here, living, but malaria is surrounding us”:making the connections between livelihoods and health using the Sustainable Livelihoods Approach in the Kilombero Valley, Tanzania.

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Introduction and background to the study: Living in the Kilombero Valley

The aim of this paper is to better understand the connections between livelihood strategies and the ability to deal with health risks and to follow advice on healthy behaviour. In spite of significant reduction in the incidence of malaria in Tanzania, especially through the use of Insecticide Treated Nets (ITNs) (WHO 2011), the Kilombero Valley remains an area with high rates of mortality and morbidity from malaria (Hetzl et al 2008). Application of the Sustainable Livelihoods Approach (SLA) helps us to understand this puzzle. Despite the villagers' unrelenting hard work on a variety of livelihood strategies, their households have experienced a reduction in human, social, natural, physical and financial capital, which in turn limits their ability to follow current health promotion advice, where people's choices in relation to health are severely restricted by their social and economic context. The application of a SLA not only aids our understanding of this situation, but also draws attention to local level developmental interventions that could have a significant impact on improving the health and wellbeing of villagers in the Kilombero Valley, and potentially elsewhere in sub-Saharan Africa.

The Kilombero Valley with its extensive wetlands is bordered by the Udzungwa Mountains to the north and the Mahenge highlands to the south. The land is used to support a range of livelihoods, and while most households are dependent on rice cultivation, many are also involved in forestry, hunting, and agricultural production of cassava, vegetables, maize, and bananas which are grown on smallholdings (Kangalawe & Liwenga 2005). Unfortunately, several development initiatives have led to poor returns for the people living in the valley. First, at independence, people were moved to 'village centres' along new roads where schools, village offices and clinics were built. While this had many positive aspects, it also led to villagers having to travel long distances to the land which they farm. Secondly, the new Village Development Committees (VDCs) were used for implementation rather than decision making (Kelsall 2004), a legacy that has had a lasting impact where the VDCs in the valley are expected to mediate and make decisions on agreed land use, but many feel unable to do so. Thirdly, more recent attempts to provide cash crops and paid employment, for example on sugar and teak plantations, have not really benefitted the villagers in the valley because they have not provided significant additional income or employment. Finally, the valley has experienced considerable population growth, both from the natural growth of indigenous farming communities as well as an influx of new pastoralist groups. This suggests some positive gains with fewer children dying and people living longer. But an increasing population has also brought pressure on the land and has led to a range of environmental problems such as deforestation, overuse of soils, trampling of soils by animals, and ever increasing demand for water resources (Kangalawe and Lyimo 2010), all of which have forced farmers to cultivate land further and further from their villages. Insufficient land and water for agricultural livelihoods, and limited non-farm sources of income (Ellis and Mdoe 2003) have led to an inability to escape rural poverty. While rural people in the Kilombero Valley have developed coping mechanisms and increased forms of social capital, their resilience remains 'thin' (Obrist, et al 2010), and insufficient to deal with decreasing returns on their various livelihoods strategies. As households focus on the need to grow enough food to provide for their families and to acquire sufficient cash income for school fees and basic necessities, health prevention becomes difficult, and health services too often a luxury.

Malaria is endemic in the Kilombero Valley, where much of the land is part of a tropical wetland that floods each year.(1) Distribution of Insecticide Treated nets (ITNs) is a strategy adopted by the Tanzanian government, NGOs, and the Roll Back Malaria Partnership and, as the World Health Organization argues, scientific evidence from a range of countries demonstrates that if ITNs are used *regularly* they provide effective protection against malaria infection transmitted by mosquitoes (WHO 2011)(2). Various promotional programmes, such as social marketing, have

been successful in improving understanding of the causes and symptoms of malaria, as well as the ownership and use of ITNs (Minja et al 2001, Hetzel et al 2007), though poor diagnosis, lack of drugs, and the wrong use of medicines, remain problems in the delivery of health services (Obrist et al 2007). Although some studies report high usage of bednets in the Kilombero Valley (Hetzel et al 2008), there is also evidence of limited use of bednets in north-western Tanzania (Nnko et al 2012), while our own work in the Kilombero Valley has shown that shifting sleeping patterns due to cultural beliefs and livelihood patterns mitigate against the consistent and sustained bednet usage which is called for by public health policies (Dunn et al 2011). This article builds on our previous work by exploring further the patterns of work associated with livelihoods and villagers' subjective assessments of their increasing poverty, making the links between their daily lives and risky health behaviours. Sensitive issues, such as norms and practices at funerals, and leaving children behind in the villages whilst farming, were discussed only after several repeat visits to participants when trust had been established.

A theoretical and methodological framework: Sustainable Livelihoods Approach (SLA)

This article uses a livelihood approach to demonstrate how the search for sustainable livelihoods is pervasively affecting health related behaviour, in terms of strategies for preventing ill health, adopting healthy practices, and accessing health services. The Sustainable Livelihoods Approach (SLA) provides an understanding of the multiple and conflicting demands on the time and energy of people living in the Kilombero Valley through considering changes to their assets, capacities and income. Their various 'capitals', social, human, natural, financial and physical (Figure 1), are linked to their livelihood strategies, outcomes, and vulnerabilities. In this case, vulnerabilities to poor health are a particular focus.

Figure 1 Sustainable Livelihoods Framework, Practical Action, <http://practicalaction>

The SLA has a long history in development policy and practice, being built on the work of Robert Chambers whose concern for people-centred development (Chambers 1997) led to a framework that was holistic and dynamic, and considered the economic, political and social dimensions of sustainability, with an attempt to make links between micro and macro levels of activity (DFID 2010). SLAs have been applied to health related concerns such as HIV and AIDS, where the approach has enabled a better understanding of how sickness has multiple impacts on vulnerabilities and livelihoods (Seeley 2002), and as a means to identify processes of resilience and ways of dealing with access to medical treatment (Obrist et al 2010). It has been argued that additional livelihoods research should be carried out at a micro-level with active engagement of participants, while the structural and institutional context must be understood alongside a 'detailed understanding of social relations in a particular historical context' (Murray 2001: 5). Application of the SLA has also led to various critiques, where insufficient attention can be given to the dynamic aspect of social relationships, thus missing a sense of 'change over time'; that issues of power can be under-represented; and that the importance of cultural attitudes and beliefs and their influence on decision making and subsequent behaviour can be hidden (de Haan and Zoomers 2005).

Building on the previous use of SLA in considering access to health (Obrist 2007) and the influence of health on livelihoods (Seeley 2002), SLA will be used in this article to explore how the quest for sustainable livelihoods can have negative impacts on villagers' ability to stay healthy, to implement health prevention advice, and to seek health treatment, where they recognise that their behaviour is risky for their health and that of their family. Following on from the critiques identified in the literature, this analysis gives specific attention to the important role of social relationships, uses of power, and the influence of attitudes and cultural beliefs on villagers' decisions. The analysis demonstrates that the continuing search for sustainable livelihoods is perceived as more important than protecting their health, and thus, even with increased awareness and

understanding of health issues, and knowing 'what they should do', there have been limited improvements in their overall health, including reducing the high levels of illness from malaria.

Study area and research methods

The research on which this paper is based forms part of a collaborative project between Durham University, Wageningen University, Aberystwyth University and Ifakara Health Institute investigating the relationship between the management of natural resources and health-related behaviours in the Kilombero Valley, and was funded by the National Institutes of Health (USA). Initially, a community survey was conducted in conjunction with the Ifakara Demographic Surveillance System (DSS) with 19,539 households in 26 villages in the Kilombero Valley covering basic household data and awareness of issues related to health with a focus on malaria. The DSS is part of an African and Asian demographic survey, operating at 38 sites, and coordinated by the International Network for the Continuous Demographic Evaluation of Populations and Their health (INDEPTH).

The DSS survey data identified important background data, for example that there is a complex mix of ethnic groups in the valley: originally the Wapogoro (21%) and Wandamba (13%) settled in the valley, with more recent arrival of Wahehe (14%), Wangindo (9%), Wabena (7%) and Wasukuma (7%), and smaller numbers of Maag'ati and Maasai, as well as being religiously mixed with Christian (68%) and Moslem (28%) households (Survey data 2008). The survey was also useful in providing initial information on a range of themes related to health care and prevention, as well as the problems experienced by villagers. The themes to emerge from the quantitative data and subsequent qualitative research informed the selection of two villages for further in-depth research. It was decided that there should be a village in each of the districts within the Kilombero Valley, Kilombero District and Ulanga District, and where we would have access to gatekeepers. Both villages are part of the wider DSS survey so there is good baseline data. It was important to select two villages that reflected common problems and issues in the valley, such as endemic malaria (3), poor health services, limited availability of land and water, and lack of alternative sources of income, thus ensuring that they were representative of the wider Kilombero population. In addition, it was also important that the selected villages would have significant populations of both pastoralists and farmers, so that the views of both groups could be ascertained. A UK researcher and two Tanzanians were responsible for six periods of intensive qualitative data collection with villagers (focus groups, interviews, participatory activities) over four years (2008-2011), with research encounters being conducted in Swahili, and data subsequently transcribed into English.

While the DSS questionnaire was focused mainly on health matters, and was largely based on a scientific, quantitative and medical approach, the introduction of the qualitative research through the NIH grant employed a social science approach, and took a wider perspective exploring livelihoods and daily living, and thus uncovered the many compromises which villagers have to make in regard to health behaviour. For example, while the majority of respondents to the DSS questionnaire survey said that they used bednets on the night prior to the survey (88.4% of adult males, 89.4% of adult females, 86% of those aged 5-17 years and 92.2% of children under 5 years), the qualitative research highlighted the many circumstances under which bednets were *not* used, reflecting a much more nuanced and complex picture of health related behaviour.

Four focus groups were conducted in each village: men and women farmers, men and women pastoralists, to reflect both the main division in livelihood and the division perceived as causing conflict over natural resources. Women were given their own focus group given concerns about their lack of voice in mixed gender groups (Momsen 2006). The pastoralists were from the Sukuma tribe, and the farmers primarily from the Wapogoro, Wahehe and Wandamba tribes. The first focus groups were conducted in February 2008, and were repeated again in April and July 2009, and August 2011, allowing sensitive issues to emerge as trust was established. In-depth, one-to-one interviews were carried out between 2008 and 2009, and a range of dissemination events were conducted in 2010. It was in the second round of focus groups that the issue of having to leave school age children alone in the villages during the growing season was

discussed most fully, and in the third set of focus groups people spoke much more about funerals, celebrations, and other times when they did not use bednets (Dunn et al 2011). The participatory exercises helped us to further explore villagers' 'everyday lives', and included group maps of their villages, identifying important resources and services; a detailed pictorial representation of their daily activities including both the wet and dry seasons; and finally a map that detailed the spatial characteristics of conflict from their perspectives. The focus on their households and every day experiences, uncovered a whole range of intersecting influences related to their economic (poor returns on their work), social (importance of maintaining cultural norms at funerals), and environmental (scarcity of land and water) context that led to practices that mitigated against healthy individual choices.

The focus groups and in-depth interviews with participants confirmed many of the points raised in the literature discussed in the previous section. While most villagers are involved in growing rice, for subsistence and as a cash crop, they are also engaged in other livelihood activities such as fishing, hunting, growing vegetables, and rearing livestock (interview, Village Chairman, Ulanga District, 2008). There are conflicts over the use of land, particularly between farmers and pastoralists, and as Kelsall (2004) wrote, many villagers felt Village Committees were unable to deal adequately with these conflicts, with such responsibilities going beyond their capabilities and authority (Focus Groups, Farmers and Pastoralists, 2008, 2009, 2011). The new cash crops – sugar and teak plantations – did not appear to have much impact on the villages, and we could find no one who said that a family member was employed by one of the large companies in the valley (Focus groups 2008, 2009). Finally, the participants confirmed that they experienced malaria within their households and saw illness from malaria as a regular and inevitable aspect of their lives, “Yes we are here, living, but malaria is surrounding us” (Focus group, Men Pastoralists, Ulanga district, 2008).

Daily lives: understanding livelihoods and malaria in Kilombero Valley

It is an early start for women in the valley; before dawn they are collecting water from one of the few, working water pumps in the village. As demand is heavy, this involves arriving very early in the morning and waiting in line. Often with a child on her back, for a woman collecting water before daybreak, it is a prime time for bites as mosquitoes rest in the puddles around the pump:

You know this is very tricky, sometimes I have to go to the pump before 6:00 am, ...and when I come back in the evening I spend a long time queuing at the water pump, even until bedtime. (Interview, woman villager, Ulanga, 2008)

Water is a big problem for us...we have to go to fetch water even at night and so get bitten by mosquitoes. So some of us get malaria as a result of this.... These are the main problems, water and mosquitoes....We just live with the problems. (Focus Group, Women Pastoralists, Kilombero District, 2008)

Little seems to have been done to improve the number of working water pumps in the villages, which forces others to use the river water, as discussed in the following extract:

...another problems is water, all water sources are dried. We have a very difficult life here... in October and November we do not sleep, we search for water the whole night as most of our midundiko (water pumps) are not working....we are suffering here as there is one water source [the river], the same place for washing for both cattle and human beings.... is also here we are drinking dirty water, such water is unsafe to our health. (Focus Group, Women Farmers, Kilombero District, 2011)

It is often a rush to get the children and men fed and ready for the day's work. However, at some times of the year in the Kilombero Valley, particularly from January to April, there are serious problems of food insecurity, and many women said that they did not prepare breakfast, 'there is no food, the afternoon meal is the first meal'. (Focus Group, Women Farmers, Kidugalo, 2009).

In sub-Saharan Africa the gendered division of labour in agriculture generally means that men prepare the land and do the heavy labour, while women are often responsible for the repetitive and daily tasks of weeding and planting (Momsen 2010). However, at a local level a range of factors, including types of farming systems and availability of land, affect gender roles and in the Kilombero Valley both men and women play a part in the regular work of planting, weeding and harvesting. However, our participatory time line activities revealed how household tasks and child care remain the sole responsibility of the women who work longer days and have less leisure time than men. As their shambas (farms) are generally some distance from their homes, travelling back and forth is very time consuming for villagers:

We walk for 3 hours so we get there at 9am and we start working, and we work until 3pm, and then we walk back and return home at 6pm. We eat only one meal a day during the rainy season, there is no food for two or three meals. (Focus Group, Women Farmers, Ulanga District, 2009)

In the evenings, some of the villagers return home, but for many families, parents remain on the shambas during the growing season in order to plant, weed and protect their fields, as the distance to the village is too long to travel each day. They can stay for several days, weeks, or even months, returning home sometimes to give food to their children, or if there is an emergency.

Land is a problem nowadays, people have to go very far to do agricultural production... even water is a problem. As a teacher I can say this has an impact on school performance because parents stay in the shamba, far away from here – this was not common in the past years... As a farmer I can say this affects my family life because my wife has to stay in the shamba shelter for the whole period of farming. It is about eight kilometres from here - about two hours walking. (Interview, male teacher and villager, Ulanga District, 2008)

This pattern of behaviour is linked to the necessity for family labour, and people are aware that this can lead to risky behaviour with many unintended consequences for their families.

Children need care from their parents; it is difficult for them to care for themselves.... This affects their behaviour, health, school attendance and performance, even girls are sleeping at the houses of the boys. (Interview, woman teacher, Ulanga District, 2008)

Yes, most of the time we live alone, than time spent with parents in the village.... Some of us never attend school...we take care of ourselves.... sometimes we work in order to get money for food..., we normally forget to use bednets, we do not do it properly as mothers do...(Discussion of findings with school children, Kilombero District, 2009)

Sleeping accommodation in the shambas tends to be very basic, comprising simple shelters and many respondents said they did not have nets, or the nets are not used, and because of the rains this is in the season when the mosquitoes are most active. Many school age children who remain behind in the village also reported not using bed nets because they are not 'told to do it', are sleeping in groups without enough nets, or do not like to sleep under nets (Makungu, 2011). Thus, both parents and many school age children are at risk of malaria transmission because their land is too far from the village to return home each day, as illustrated by the following participant:

I go to the shamba to farm from January to June with my young children, the school age children stay in the village. They were taken care of by my oldest daughter- she was 12 years old. But, last year they came to tell me about her illness, I came to the village and found her sick...we took her to the Health Centre, later she was admitted to Hospital, where she died...they said it was malaria. I went in January, and she became sick in March...she was alone there until we came....(Interview, Religious leader and Villager, Kilombero District, 2008)

Generally, parents feel badly about leaving their children and were embarrassed to discuss it, but they also saw no alternative: 'we have to leave in order to grow food for our children', a difficult compromise between their livelihood and protecting their family's health. In addition, during the wet season people are not able to easily travel to the village due to widespread flooding and impassable dirt roads. Both these problems, linked to the demands of their livelihoods and a lack of infrastructure (roads and transport) have a direct impact on the health of their children.

During the dry season, if you have rice you can sell it and take your child to the hospital....but, I am telling you that the period of rainy season has its problems due to the fact that a person can tell you that your child has become sick at 8:00pm, but he died at 5am the next day before taking him to hospital as you are waiting to find money in the morning. ... In the dry season I can even carry my child on my back and rush to the Health Centre, but during the rainy season it is difficult even to travel due to the floods (Focus Group, Male Farmers, Kilombero District, 2011)

While crops are grown for sale, villagers often feel they are exploited by more powerful people where, with little information and few buyers, as well as a lack of adequate storage for their crops, they have to sell the majority of their products when the price is low.

As farmers we are suffering a lot, there is a problem about the price, it is too low and we are exploited....If my child is sick I have to sell my crops to a business person who gives a low price, and we do not have the money to build a storage place. (Focus Group, Women Farmers, 2011)

During the dry season there are different reasons why bednets may not be used. Many respondents admitted that they found it 'too hot to sleep under nets during the dry season', and as there are fewer mosquitoes, it did not seem so important (Focus Groups, Ulanga and Kilombero Districts, 2008). This is the time when people are able to travel so there are many celebrations, and while there are funerals throughout the year, the dry season allows more people to attend. At both celebrations and funerals people sleep outside for several days as they last from three days to a week. Participants spoke of attending 10 or 12 funerals a year, and at these events it is considered culturally unacceptable to use a bednet or other 'luxuries' such as mattresses.

For funerals we normally sleep outside the house...we do not carry mattresses or bednets. People would say you are too proud... that you are pretending to be a modern person...people do not see the importance of sleeping under a net, they say it is only for two or three nights.... And it is a time for mourning, you have to tolerate pain...people who sleep under a net will be perceived badly and people will discuss you a lot. (Focus Group, Women Pastoralists, 2011)

Thus, for cultural reasons and the wish to have good social relationships, most people expose themselves to mosquito bites on a regular basis, potentially about once a month for several days.

In the questionnaire survey 96% of respondents classified themselves as 'farmers' and 46% reported owning livestock (survey data). While the farmers usually own a few animals, it is the pastoralists that maintain large herds of cattle and goats as a way of life, although as many are now also involved in agricultural activities they are often referred to as agro-pastoralists. Cattle require feeding, milking and taking to pastures each day. This work is gendered: the women prepare the animals and milk them and are responsible for growing food, the men take responsibility for herding and going to market to sell animals. A very common concern in the villages is the conflict between pastoralists and farmers, mainly centred on the over-use of land and water resources.

...our relationship with farmers is very poor, there is hatred...they want us to go But, according to my experience overstocking destroys the environment,

and I think pastoralists need to be educated on this...(Interview, pastoralist leader and farmer, Kilombero District, 2008)

The valley is remembered by residents as a fertile land where food was once plentiful and people 'had a good life'. This has changed due to an increase in population, both a natural increase in the indigenous farming tribes, and an increase through pastoralists migrating to the valley in search of good pasture for their cattle. They are moving to the valley because their own numbers are increasing, as are their herds, and their previous land has become unable to sustain these increases. Increased pressure on the land has meant that land can no longer remain fallow to replenish its fertility, but instead is used every year for production. It was a widespread judgement from the villagers that their yields have been decreasing, for example one farmer said:

"I use to earn 70 bags of rice in the years between 1995-1998, but on the same amount of land, I now get 8 bags of rice. (Focus Group, Men Farmers, Kilombero District, 2011)

Now, they go hungry and often do not have enough food throughout the year for their families, with potential impacts on their health and ability to withstand infection. However, less food was also attributed to conflict over land; for example, villagers no longer have a second crop of rice to help them through the start of the planting season when they have less food and need to wait for the harvest.

Formerly we use to plant rice in October, so that rice grows from November and December, we did that because our land had enough moisture, but it is impossible to do that now...the land is so dry we have to wait until February (wait for the main rainy season)...so tell us how can we get a good harvest if we start planting in February?...we had a tradition of harvesting two rice crops from the same rice plants, but now it is impossible as cattle feed on the rice plants...that is why there is famine here. (Focus Group, Men Farmers, 2011)

In addition heavy demands on water have meant that streams have run dry and land is too hard and dry to plant.

.... if you go down there the place [river valley used for rice and vegetables] is about to turn into desert. In the past I dug a few meters and I got water for the whole dry season but nowadays it is impossible...this land has become very dry. (Interview, pastoralist, Kilombero District, 2008)

To supplement their incomes men fish, putting themselves at risk of mosquito bites because of the lack of protection and being surrounded by water. They also sell items such as cooked food at local markets. (Focus groups, Men Farmers, Ulanga and Kilombero Districts, 2008 and 2011). There seemed to be little opportunity for waged work and, as stated earlier, none of the participants said that members of their households worked on the sugar or teak plantations. Thus, one has a sense of men and women working hard from dawn until dusk, primarily on subsistence agriculture with some crops such as rice sold for income: with less food, assets and income than previously, and with the added strain of conflict and tension between neighbours. Ideas about the cause of conflict differ, as shown in the participatory mapping exercises, where pastoralists saw the main area of conflict as taking place along paths for their cattle, whereas farmers saw the conflict as more widespread and affecting their shambas (Figure 2).

Figure 2 Perceptions of conflict, shown by red dots, throughout the farming area in the women farmers' map, and located along the paths in the map produced by the women pastoralists. (Focus Groups, 2009)

Such on-going conflicts, and the experience of trying to resolve them through land use plans that were not implemented, has lessened the 'social capital' of the villagers and thus their ability to work together.

Land Use Planning was done a few years ago. It was not very successful since most of those who were given land for farming have now shifted to grazing (Focus Group, Men Farmers, Ulanga District, 2008)

I suggest that the village government allocate a small amount of land to people equally, it is a starting point, then all people should abide by the laws... but I do not think it is possible for {our} village. The way I know people here! I don't believe it will happen...people do not know how to use shared land equally. (Dissemination event, Village Hall, Kilombero District, 2009)

This apparent inability to implement 'agreed' plans at a village level has had an impact on villagers' resilience and attitude to working together, even when they have common thoughts on improvements. For example both pastoralists and farmers feel there should be a reduction in the number of cattle, yet they appear unable to work together on this and they perceive the conflicts as getting worse. Respondents felt that the stress associated with the conflicts over land continued to have implications for their health. In addition, the need to protect their farms at night from animals means there are additional nights when they are at risk and often not using bednets at their shambas. Once again, the daily demand for food means that maintaining their livelihoods, and a focus on the conflict, is much more important than protecting their health.

After the agricultural work is completed for the day, adults either return to their home, or during the growing season many remain at the shamba. While women in all communities seem to work from before dawn until late into the night in order to complete their household tasks, men do have periods when they can relax, particularly in the late afternoon while the dinner is being prepared and in the evening. When in the villages, men often go 'to watch TV' or to drinking clubs, returning late at night (Focus Groups 2008, 2009). Such places are not screened and the men have no protection from mosquito bites. The women, on the other hand, are often working out of doors, washing dishes or looking after children who are also outside, or again, collecting water after nightfall, when they are at risk of mosquito bites, but without protection.

Applying a livelihoods perspective to health related behaviour

This section will apply the sustainable Livelihoods Approach (SLA) to the findings discussed in the previous section. The SLA provides a sense of change over time. The assessment of the villagers was that in the past they had many assets that allowed them to have a good livelihood in the Kilombero Valley (Table 1). The land was fertile and there was adequate water and land (natural capital). They have knowledge of the land and the capacity to work hard (their human capital). Through the socialist ideology of the new Tanzanian state, from independence in 1961, they had some experience of working together, of village committees, and a sense of collective responsibility (social capital). In addition the government provided schools, health clinics, and village halls (physical capital). However, many of these assets, the availability of sufficient land and water, adequate services, and working together, have been weakened over the intervening years. Villagers continue to work hard but the returns are lower; they have less income and less food, leading to poorer nutrition (human and financial capital). The need for family labour means that children are often left alone, having an impact on their school attendance, the ability to concentrate and thus to learn while at school (human capital). Both parents and children are trapped in poverty, with the life chances of the children for their future constrained by the need to grow food today. A SLA highlights how the choices they make in order to obtain adequate

livelihoods is having an increasingly negative impact on their human, social, natural, financial and physical capitals.

While this study has been at the micro level, exploring the views and experiences of individuals and their households, the SLA can help to illuminate the links to national and global policies as the context for their livelihoods. Although Tanzania has achieved GDP growth rates of 6%-8% over the last ten years, this growth has not led to significant reductions in income poverty (GoT 2012). In addition, approximately 23% of households experience food shortages, with three quarters of the population relying on small holder agricultural production, the main livelihood strategy within our sample. The self perception of the villagers was that 'in the past life was better'. Current neoliberal policies that focus on improving market access and providing new employment opportunities are not working for these people. While some studies suggest that rice production has increased and there is a surplus for sale in the Kilombero Valley (Kato 2007), other issues raised from our study, such as the lack of good transport to get their products to markets, monopoly markets based on a few powerful buyers, and lack of storage, means they have to sell their crops at a low price, so the returns are poor. Supposed new employment opportunities at large plantations, encouraged by current economic policies, are also not benefiting these communities, where no one could cite a family member that was employed on the plantations.

The sugar and teak plantations not only have an impact on local livelihoods, but also on the wider ecological balance in the valley, taking up significant land and water that makes the scarcity of these resources even more serious for local small scale farmers (focus group discussions). How to manage land use remains a very difficult issue: land use plans by villagers are difficult to implement, the government has started evictions, where it is argued that people become landless as they have not been allocated new land (Kitabu 2012). While farmers often said they would just like the 'pastoralists to return to where they have come from' (focus groups), Pastoralists respondents said they want to take advantage of new laws that allow them to buy land, land which has been used as common land in the past (focus groups). The Kilombero Valley Teak Company (KVTC) also has an impact on the ecology of the Valley by providing foraging and habitats for large mammals (Bonnington et al 2009). While National Parks bordering the Kilombero Valley, the Selous Game Reserve and the Udzungwa Mountains, limit the villagers' access to firewood, to land, and to wildlife (Focus groups), clearing of woodland for agriculture and grazing has had a detrimental impact on wildlife and the survival of many species (Belle 2011). Thus there is an urgent need for sustainable management of natural resources across the Kilombero Valley, taking into account the needs of a range of stakeholders (Belle 2011), something which village level committees, on their own, lack the capacity and resources to do effectively. Thus, the wider economic and ecological context has a profound impact on the livelihoods of the villagers.

The SLA demonstrates the link between vulnerable livelihoods, and poorer health and the inability to follow public health advice. The villagers perceive that they now have poorer nutrition than previously and are at increased risk of malaria transmission where livelihood patterns mitigate against regular and sustained bednet usage (human capital). As our data also testify, men, women and children are active outside (waiting at water pumps, searching for plants, socialising in bars, playing in fields) where mosquitoes are present, again with no protection. Experience of ineffective community decisions and the often inability to implement such decisions has reduced their social capital, and has contributed to a feeling of 'helplessness' and a view that the government and experts should do more for them. In understanding socio-cultural norms, it becomes apparent that it is more important for villagers to act appropriately at funerals and celebrations, than to protect themselves from malaria by sleeping under a bednet. Maintaining social relationships with their relatives and following cultural practices that are valued by the community are important forms of social capital. Both men and women are socialised into roles (social capital) that have an influence on health: women have to complete all their household tasks – it would be unthinkable not to collect water, even if this means standing for long periods at water pumps - and men believe that their periods of rest and entertainment are more important than protecting themselves from mosquito bites when drinking and watching TV at night in the

open. Maintaining their social capital, and fulfilling their social norms is of daily importance, and often leads to risky health behaviours.

Table 1 Applying a Sustainable Livelihoods Framework to understand changes in assets and increased vulnerabilities

Both livelihoods and social networks have become increasingly strained due to the conflict between pastoralists and farmers over the use of land and water (Brehony et al 2004). The environment (their natural capital) has become degraded, the soil less fertile through over-use, while water sources are inadequate for the present livelihood strategies, and have become polluted and 'dirty', again with obvious links to ill health. Many participants said there were few alternatives to family farming with very few opportunities for employment. Reducing family income and a lack of accessible credit (financial capital) (Interview, male teacher, Ulanga District, 2008) has meant that the villagers are unable to invest in improving farming and husbandry. Health services and medicines are often unaffordable and seen as a luxury. Thus waiting until an illness becomes serious before seeking treatment is logical, as accessing the treatment often involves reducing their financial capital by selling food to pay for transport and health care. Their limited livelihood strategies - subsistence agriculture on fields at substantial distances from their main home, and growing numbers of animals with insufficient land and water - has increased villagers' vulnerability, both to remaining in poverty and in being able to follow health protection advice from professionals.

Improving livelihoods and health outcomes

Respondents were aware of both what they 'should do' in terms of their health and the health of their families, and of the limitations they face. However, there were also thoughts on possible improvements (Table 2). There were a number of practical suggestions for what the government could do to help them: passing 'laws' or guidelines, repairing water pumps, building small bridges, providing storage facilities for their crops. From government and NGOs the request is for more information – on how to resolve conflicts, on better farming and husbandry practices, and most importantly, on how to access and make the most of market opportunities.

Table 2 Strategies to improve livelihoods that would have a direct impact on improving health outcomes

For example, they did not feel they could change people's attitudes on their own, but if the government 'passed laws' then people would have to pay attention, for example in the use of bed nets at funerals:

This matter is difficult, we are all aware of the health campaigns, they insist that we have to sleep under bednets. On the other hand it is our culture and custom that does not allow us to use bednets at funerals... It is possible to change...it is difficult for us to start this move, but if it was initiated by professionals, or by the government, then slowly it can be understood properly...the government can intervene by imposing laws, that people must sleep under bednets during funerals no matter what. No one will ignore that, no one will complain, he will not be regarded as immoral, it will be accepted that he is complying with the government's orders. (Participants, Focus Group, Men Pastoralists, 2011).

Having more working water pumps was suggested by participants as a way to protect women from malaria. In addition many respondents felt that there should be a form of protection that worked on the body, rather than relying on bednets for protection.

Water is a critical problem in our village...even today my wife was there since 3am, it is normal to find the women there at 2am or 3am. I think we should talk about solutions, like using repellents for women when searching for water, and maybe when men are socializing (Male respondents)...., also if the government would help us by building more wells and pumps that would solve the problem of spending a long time in the queue (Female respondent, Dissemination Event, Ulanga District, Village Hall, 2009)

Parents do not want to leave their children at home during the growing season, but found little alternative. Even something as simple as building a small bridge to allow them to cross rivers on the way to their shambas would greatly improve their lives, and have an impact on their families' health, as they would be able to return home each day and everyone would be much more likely to be sleeping under a net.

Our shambas are too far from here so we have to live at the shamba leaving our children in problems... sometimes you have to cross the river so you are unable to go and return each day to look after your children...We have failed to solve this problem, will you help us to construct bridges? If there were bridges we could go and return because we have bicycles? (Focus Group, Women Farmers, Kilombero District, 2011)

What participants mostly asked for was more information and 'education', not on health, but on how to resolve the conflicts over sharing land, and to learn better farming and husbandry practices.

Do you have any questions {the interviewer}?
No, not a question but a suggestion. I would like to beg you to convince the government to provide education to people on conflict...at least one day we can meet with farmers to discuss development things and not conflict everyday, we are tired of this conflict. (Interview, pastoralist and village leader, Kilombero District, 2008)

With the rise in population, so is the demand for natural resources, the government should provide us with knowledge/education on different strategies for using the resources sustainably (Focus Group, Women Pastoralists, Ulanga District, 2008)

Women are facing the problem of lack of information and they do not make decisions, normally we expect all decisions to be made by men, therefore it is difficult for a woman, (Participant, Women Pastoralists, Kilombero District, 2011)

Strategies to improve agricultural practices would improve yields and increase income, and both pastoralists and farmers recognise that fewer, healthier cattle would help the environment and bring a better return to them.

It is true there are lower yields,...so I would say poor people should be empowered, like educating them on farming techniques, I would say more roads should be constructed, and we need ranches for our cattle, to protect our water sources...yes, we need your help to educate us... We continue to be poor because we keep our cattle in local ways, if we improve our animal husbandry, like reducing the number of animals, we will earn more and our river water will be better (Focus Group, Women Pastoralists, 2011)

It is impossible to make arrangements for one parent to remain at home when we are depending on hand hoe. I think the government should subsidise farming, if we could use tractors and use sprays to kill grasses we could come home, we need to solve the poverty problem in order to solve the other problems, and small cooperative association would

assist farmers financially through difficult times (Dissemination Event, Ulanga District, Village Hall, 2009)

Responding to some of these concerns, a new initiative during this research was the development of two pilot 'Herder Field Schools' where 45 participants from the study villages developed their own curriculum that was focused on improving animal husbandry. Three workshops were held over a period of 18 months (April 2008 to September 2009), including the development of a training manual (Sumaye et al 2010). Some focus group participants commented on how the new methods were continuing to be implemented, and that this had improved the health of the cattle, and improved their income. Interventions such as the Herder Field School which are targeted at improving livelihoods could have an important impact on villagers' health and their ability to follow health related advice. For example, if workloads were reduced and income was increased, the number of cattle could be reduced, reducing the damage done to the environment and increasing available land for farming, all of which would improve their overall health and nutrition, as well as contribute to a reduction in the communal conflict.

Thus, the respondents in this research have come up with many suggestions that would be appropriate for NGO or government involvement. However, detailed advice on how this could happen goes beyond the scope of this article, but would be an interesting follow up article, based on research and discussion with NGOs, Government District Officers and the community on the best ways forward. The success of the Herder Field School would suggest it is a good model to extend to other villages. The key point is small inputs in financial resources could have a considerable benefit on improving their livelihoods, and then their effective choices around health.

Conclusion

Many areas in Tanzania have reduced the incidence of malaria and the use of ITNs is an important part of this success (WHO 2011). However, in Kilombero Valley both recurrent illness and death from malaria remain high. This study demonstrates that constraints on livelihoods have limited the ability of villagers to follow health advice from professionals. People are generally aware of health messages and know what they 'should do', and they have bednets and know how to use them. Access and knowledge is thus not the issue. The problems lie more in villagers' inability to follow the advice they are given, and thus more attention should be paid to improving their livelihoods and addressing the constraints identified in this analysis, which will then have an impact on improving health outcomes by providing villagers with more effective choice.

While this research has been at the micro level, exploring villagers' perceptions, it is also important to be aware of the national and global context. Through a combination of perverse and unintended outcomes of both state led and neoliberal developmental strategies and the pressure on natural resources due to some of these policies, as well as increasing population, the villagers have been left out of 'progress' and remain trapped in subsistence livelihoods, with reducing yields, increasingly inadequate natural resources, and limited infrastructure that restricts their ability to diversify livelihoods and to access health care. A reduction in both income and assets makes 'choices' about health care difficult. In addition cultural beliefs, social activities, and a range of livelihood strategies make regular use of bednets very difficult: nights spent at funerals, ceremonies, at the shamba, and when it is 'too hot', add up to a significant number of nights sleeping without bednets.

The application of a livelihoods perspective, showing changes in their human, social, physical, natural and financial capitals, demonstrates where and why people have become more vulnerable, and the links to risky health behaviours. Our findings have implications for development professionals, district officers, government officials, and researchers. Understanding villagers' dilemmas and paying attention to improving livelihoods has the potential to improve health outcomes. Even relatively small projects – like building a bridge over the river to their shambas - would allow more parents to return home each night, and thus potentially increase the use of bednets. The villagers should also have access to more information and training, such as the Herder Field School, that provided them with relevant information on

appropriate animal husbandry practices. The government has a role in providing a forum for pastoralists and farmers to discuss their common concerns, with realistic action to protect the long term viability of land and water resources. If the focus is on rebuilding assets and improving livelihoods, villagers will be better able to follow health advice, take preventative action, and make better use of health treatment.

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Notes

- (1) The prevalence of malaria in Morogoro Region (including the Kilombero Valley) was 16% in 2007-2008 (GoT 2013)
- (2) 43 of 99 countries have recorded a reduction of 50% or more in reported cases of malaria. Although the data can be problematic, in sub-Saharan Africa 95% of households have reported that they own at least one ITN, and surveys indicate that 96% of persons with access to an ITN claim they use it. However, in a recent survey in Tanzania, only 16% of young children were judged to be sleeping under ITNs (GoT 2011)
- (3) For example, Q13 in the community survey (n=19,539) revealed that 10.4% of respondents had an illness with fever or malaria in their household in the last two weeks. For the two study villages, the response was 4.1% for the Ulanga village, and in the Kilombero villae, 33.8% said they had experienced fever and/or malaria in their household over the last two weeks.

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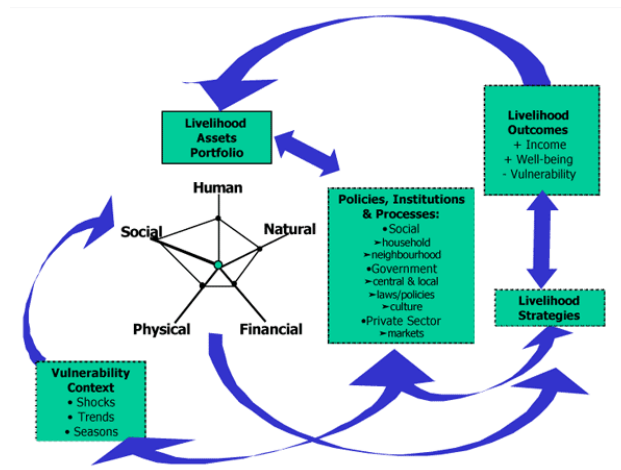


Figure 1 Sustainable Livelihoods Framework. From Practical Action, <http://practicalaction>

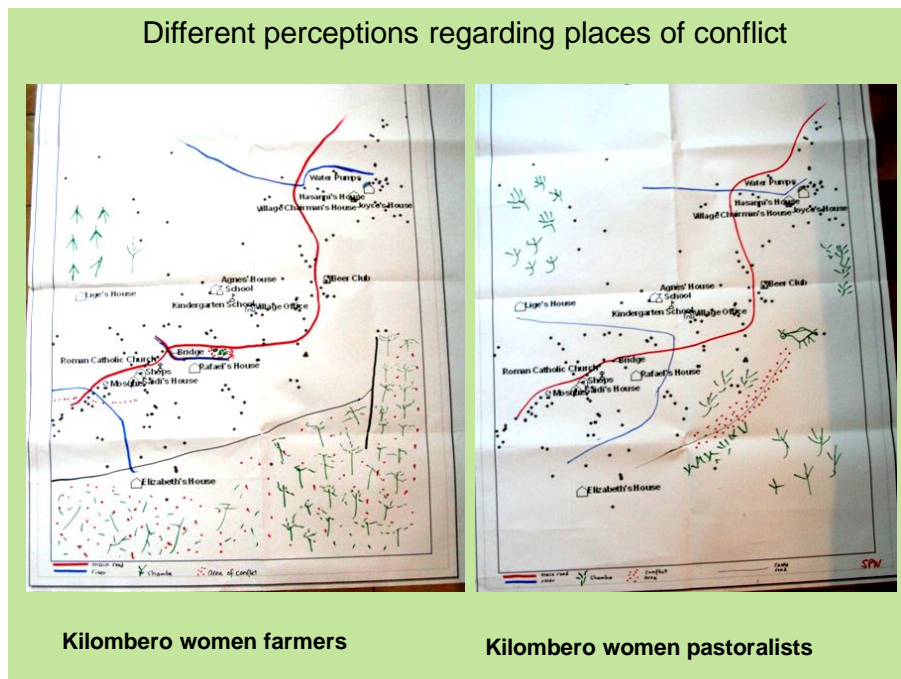


Figure 2 Different perceptions regarding places of conflict. Perceptions of conflict, shown by red dots, throughout the farming area in the women farmers' map, and located along the paths in the map produced by the women pastoralists. (Focus Groups, 2009)

Types of Capital and Assets	Types of Capital and Vulnerabilities
human – knowledge of agriculture and environment, capacity to work	human – poorer nutrition, difficulties in attending school, limited understanding of the causes of illness and appropriate use of medicines and preventative measures, request for knowledge on improved agricultural practices; poor diagnosis and inadequate self treatment gendered division of labour, decisions, access to resource, and to risk, including health
social –history of working together, socialist ideology, sophisticated networks of kinship, patronage and social support, collective representation through village leaders, mechanisms for participation through Participatory Land- Use Planning Committees and Conflict Resolution Committees	social – communal networks under strain due to conflict over natural resources between farmers and pastoralists; participatory structures lack authority
natural – fertile soil, extensive river system, forest products	natural – continued pressure on land, water, and fuel wood, degradation of land, drying of water supply, limited use of forest
financial – subsistence farming, some cash crops, livestock, some savings but used annually to cover 'hungry period'	financial - lack of alternatives to subsistence agriculture, few opportunities for cash income or diversification, limited access to credit
physical – schools, clinics, village halls, small local shops	physical – poor roads, insufficient water pumps, limited transport

Table 1 Applying a Sustainable Livelihoods Framework to understand changes in assets and increased vulnerabilities

Improving Livelihoods	Improvement to health outcomes
human Education and training in improved agricultural and husbandry practices – Herder Field School as a successful model to follow Greater range of preventative strategies, for people at night and dawn when not under nets	Improved incomes leading to better financial and human capital, ability to spend on health services Prevention –follow the person – less risk of malaria
social Participatory management – need for authority Provide forums for farmers and pastoralists to discuss together	Improve outcomes for local level participatory management by giving village committees more authority and government to implement their recommendations – thereby improving social capital and reducing stress and conflict
natural Reduce size of herds	Improve environment, less use of land and water, additional rice crop, better overall health and greater access to water
financial Diversify livelihoods, improve yields, better markets for cash crops, micro finance for small enterprises	Improved diet, more resilience to illness
physical Infrastructure: roads, transport, storage	Improves ability to access hospitals and clinics Bridge to fields would allow parents to return home – thus increase use of bednets Storage would improve incomes – allow people to sell when prices are high

Table 2 Strategies to improve livelihoods that would have a direct impact on improving health outcomes